## REMARKS

### Status Summary

Claims 1-14, 16-24 and 32-67 are pending in the present application. Claims 48-56 are withdrawn as being directed to non-elected subject matter. All remaining pending claims presently stand rejected. Claim 66 has been amended.

### Claim Rejections - 35 U.S.C. § 112

In the above-identified Office Action, claims 18 and 58 are rejected 35 U.S.C. § 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventors, at the time the application was filed, had possession of the claimed invention. Applicants first note that the subject matter recited in claims 18 and 58 was originally contained in the application in claim 18 as originally filed. Moreover, support for an undoped form of $M^{III}N$ material is found throughout the detailed description section of the specification as originally filed, as well as the alternative of including other types of components in the $M^{III}N$ material such as impurities associated with doping. See, e.g., the specification at page 19, lines 12-14. It is well known among persons skilled in the art that an intrinsic material is one which exhibits a property of interest, such as semiconductivity, without being subjected to an extrinsic process such as doping to attain or enhance the property of interest.

Therefore, applicants believe that claims 18 and 58 comply with 35 U.S.C. § 112, first paragraph. Nonetheless, applicants have amended the specification as indicated hereinabove to expedite allowance of claims 18 and 58. The application as originally filed supports this amendment. It is believed that this amendment overcomes the rejection to claims 18 and 58 under 35 U.S.C. § 112.

In view of the foregoing, applicants respectfully request the Examiner to withdraw the rejection to claims 18 and 58 under 35 U.S.C. § 112 at this time.

Claim Rejections - 35 U.S.C. § 102

Claims 40-47, 66-67

Claims 40-47 and 66-67 are rejected under 35 U.S.C. § 102(e) as being anticipated by U.S. Patent No. 6,426,512 to Ito et al. (hereinafter "Ito et al."). Applicants respectfully traverse this rejection because Ito et al. fail to teach each and every feature recited in the rejected claims.

Independent claim 40 recites "using a sputtering apparatus comprising a non-thermionic electron/plasma injector assembly to produce a Group III metal source vapor from a Group III metal target". Ito et al. fail to teach the use of a non-thermionic injector assembly. With regard to various layers of their semiconductor device, Ito et al. merely provide general suggestions as to the possibility of employing various physical vapor deposition and chemical vapor

deposition growth techniques, and do not disclose any details for implementing such techniques.

For instance, at column 4, lines 51-58, Ito et al. refer to a GaN semiconductor being grown by an MOCVD method or an MBE method, neither of which would use a sputtering apparatus comprising a non-thermionic injector assembly. At column 5, lines 18-24, Ito et al. suggests that its TiN undercoat layer could be grown by sputtering or reactive sputtering, but do not disclose how this would be accomplished. Moreover, TiN is not a Group III nitride. At column 6, a first embodiment is described in which GaN layers are grown by MOCVD, and a non-Group III nitride reflection layer is grown by reactive sputtering. Again, a non-thermionic injector assembly is not disclosed for this embodiment. In their second and third embodiments, described in columns 12 and 13, respectively, their AlGaN buffer layer is grown by MOCVD and not sputtering. In their fourth embodiment, in column 13, they suggest forming their AlGaN buffer layer by sputtering, but do not disclose how to do so. In their fifth embodiment, described in column 28, lines 61-62, Ito et al. mention the use of a "general reactive sputtering method", which would imply a conventional sputtering method and not the unique method claimed by applicants.

Claims 41 and 42 depend from claim 40, and therefore are distinguishable for the same reasons. In addition, claims 41 and 42 recite features of the injector assembly that are not taught by Ito et al.

Claim 43 depends from claim 40, and therefore is distinguishable for the same reasons. In addition, claim 43 recites "the step of removing the template material, thereby providing a free-standing, single-crystal $M^{III}N$ article." Ito et al. do not teach this step.

Claims 44-47 depend from claim 40, and therefore are distinguishable for the same reasons. In addition, claims 44-47 recite either thicknesses or growth rates, none of which are disclosed by Ito et al.

Claim 66 depends from claim 40, and therefore is distinguishable for the same reasons. In addition, claim 66 recites producing a bulk $M^{III}N$ article from an $M^{III}N$ seed crystal, which is not taught by Ito et al.

Claim 67 depends from claim 40, and therefore is distinguishable for the same reasons.

In view of the foregoing, applicants respectfully submit that claims 40-47 and 66-67 are patentable under 35 U.S.C. § 102(e) over Ito et al., and respectfully request that the rejection to claims 40-47 and 66-67 be withdrawn at this time.

Claims 62-65, 32-36

Claims 62-65 and 32-36 are rejected under 35 U.S.C. § 102(e) as being anticipated by Ito et al. Applicants respectfully traverse this rejection because Ito et al. fail to teach each and every feature recited in the rejected claims.

Independent claim 62 recites "using the single-crystal $M^{III}N$ layer as a seed crystal to grow a bulk $M^{III}N$ layer by depositing additional reactant vapor species comprising a Group III metal and nitrogen on the seed crystal". Ito et al. do not teach using an $M^{III}N$ layer as a seed crystal to grow a bulk $M^{III}N$ layer. Ito et al. teach only the growth of films.

For instance, in their first embodiment, the table in column 5 of Ito et al. teaches Group III nitride layers having a thickness of only 35 Å. Even if the quantum well and barrier layers are repeated ten times to form a type of superlattice structure, the overall thickness is still only 700 Å. In the tables shown in columns 11 and 12, the thickest Group III nitride layer is only 4 μm, and this aluminum nitride layer is grown by an ordinary MOCVD method. In their tables in column 13, the thickness of their GaN clad layers is 4 μm. As a last example, the samples 3-17 disclosed in columns 23-28 in Ito et al. utilize an MOCVD or MBE method to grow a GaN semiconductor layer (see column 23, lines 15-22) and not a sputtering method.

Claims 63-65 depend from claim 62, and therefore are distinguishable for the same reasons.

Claims 32-36 depend from claim 62, and therefore are distinguishable for the same reasons.

In the section of the specification by Ito et al. specifically pointed out the Examiner, column 8, lines 1-55, a Group III nitride compound semiconductor

layer is grown on a TiN undercoat layer by an MOCVD method. TiN, however, is not a Group III nitride.

In view of the foregoing, applicants respectfully submit that claims 62-65 and 32-36 are patentable under 35 U.S.C. § 102(e) over Ito et al., and respectfully request that the rejection to claims 62-65 and 32-36 be withdrawn at this time.

Claims 1-14, 16-24, 37-39, 57-61

Claims 1-14, 16-24, 37-39 and 57-61 are rejected under 35 U.S.C. § 102(e) as being anticipated by Ito et al. Applicants respectfully traverse this rejection because Ito et al. fail to teach each and every feature recited in the rejected claims.

Independent claim 1 recites "sputtering a Group III metal target" and "depositing the reactant vapor species on the growth surface to produce a single-cyrstal $M^{III}N$ layer thereon having a thickness of greater than approximately 10 microns." As previously discussed, Ito et al. fail to disclose sputtering a Group III metal target to yield a single-crystal $M^{III}N$ layer having such a thickness.

Claims 2-14, 16-24, 37-39, and 57-61 depend from claim 1, and therefore are distinguishable for the same reasons. In addition, these claims recite additional features not taught by Ito et al.

In view of the foregoing, applicants respectfully submit that claims 1-14, 16-24, 37-39 and 57-61 are patentable under 35 U.S.C. § 102(e) over Ito et al., and respectfully request that the rejection to claims 10-14, 16-24, 37-39 and 57-61 be withdrawn at this time.

Claim Amendments

Claim 66 has been amended herein to broaden its scope, and not for any purpose relating to patentability.

## CONCLUSION

In light of the above amendments and remarks, it is respectfully submitted that the present application is now in proper condition for allowance, and an early notice to such effect is earnestly solicited.

If any small matter should remain outstanding after the Patent Examiner has had an opportunity to review the above Remarks, the Patent Examiner is respectfully requested to telephone the undersigned patent attorney in order to resolve these matters and avoid the issuance of another Official Action.

## DEPOSIT ACCOUNT

The Commissioner is hereby authorized to charge any fees associated with the filing of this correspondence to Deposit Account No. **50-0426**.

Respectfully submitted,

JENKINS, WILSON & TAYLOR, P.A.

Date: July 8, 2003 By: David P. Gloekler

David P. Gloekler
Registration No. 41,037

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